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Frequency, Form and Function of Dyadic Questions in Children with Autism: A CHILDES corpus study

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Abstract

Children’s questions to their caregivers – and caregivers’ questions to their children – play an important role in child development. For children on the autism spectrum, who often experience cognitive, linguistic and social difficulties, prior research on questions has resulted in inconsistent and incomplete findings. The present study characterized the frequency, form, and function of queries posed by children on the autism spectrum ($n = 12$), non-spectrum peers ($n=20$), and parents using the *Nadig ASD English Corpus* in the Child Language Data Exchange System (CHILDES). Results suggested that children on the autism spectrum and their caregivers produced fewer questions than non-spectrum dyads; however, whereas *wh*- questions were *under*-represented in the repertoire of children on the spectrum, they were *over*-represented in the repertoire of their parents. Finally, question function was similarly diverse for parents and children across groups. These findings offer important clinical implications for question-asking interventions targeting this population.

Keywords

autism; language; questions; parent; caregiver

Questions are an important tool for learning through everyday interactions in the home, at school and beyond. The ability to ask questions plays an important role in early child development, because asking questions allows children to obtain information that is targeted specifically to their interests or needs in the moment (e.g., Callanan & Oakes, 1992; Chouinard et al., 2007). Through questions, children grow their vocabularies, expand their learning opportunities and benefit from information outside their own personal experiences (Ronfard et al., 2018). Question-asking also engages children in mutual, reciprocal engagements with social partners (Doggett, Krasno, Koegel & Koegel, 2013). In these ways, children use questions to scaffold their own world knowledge, language skills and social abilities.

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In the child development literature, we often think about the questions that children ask their social partners, especially parents and other caregivers. Question-asking is an early emerging skill in both nonverbal and verbal communication, appearing in children's repertoires by their first birthday (Kovacs et al., 2014). Questions are relatively common in young children's language; for instance, in a diary study, Chouinard (2007) found that parents documented high and persistent levels of question-asking even for children as young as 12-17 months, and that in their early years, children ask between roughly 70 and 200 questions each hour. The form of children's questions seems to shift over the course of development in ways that parallel broader language development: children's earliest questions are often those asked in a simple, closed-ended (i.e., yes/no) form, as well as some forms of *wh*-questions (i.e., what, where; Tyack & Ingram, 1977; James & Seebach, 1982), and as they age, children become proficient at using a more diverse set of syntactically complex *wh*-question forms (Stromswold; 1995; Callanan & Oakes, 1992). Even young children use questions for a range of functions, and although there have been a variety of taxonomies proposed (e.g., Chouinard et al., 2007; James & Seebach, 1982; Kurkul & Corriveau, 2017), there is a common distinction between information seeking questions (i.e., requesting information about facts or causes, such as *Do you like milk?* or *Why is the baby crying?*) and non-information seeking functions. The latter includes inquiries with a assortment of other functions, including conversational (i.e., initiating or maintaining an interaction, such as, *Hey, Mom?* or *Do you want a turn?*), directive (i.e., requesting that the partner perform an action or grant permission, such as *Will you open this?* or *Can I go outside?*) or clarification (i.e., clarifying what the social partner said, such as *What?*).

We can also consider the questions that caregivers ask their children. Children are sensitive to caregiver questions by 12-15 months of age (Seidl et al., 2003; Geffen & Mintz, 2015), and a large body of literature has suggested that higher frequencies of caregiver question asking (e.g., within the context of dialogic book reading) are associated with better child language development (Muhinyi & Rowe, 2019; Huebner & Meltzoff, 2005). This seems particularly true for caregiver questions in *wh*-form, which scaffold a variety of child skills, including reasoning, vocabulary, syntactic elements involved in question formation (auxiliary and copular structures) and children's own use of *wh*-questions (Rowe et al., 2017; Goodwin et al., 2015; Newport, Gleitman, & Gleitman, 1977; Rowland et al., 2003; Luo et al., 2022; Cristofaro & Tamis-LeMonda, 2012). As with child questions, the functions of caregiver questions are diverse and include both information seeking and regulatory purposes (Gaudreau, 2021); they may also serve more instructional roles, such as recasting, in which the parent rephrases something that the child has said in order to provide a correct or more elaborate model (e.g., Conti-Ramsden, 1990; Fey et al., 1999; Cleave et al., 2015).

For children on the autism spectrum, question-asking has been a topic of substantial interest in the literature. The earliest accounts from Kanner (1943) and Rutter (1971) describe children on the spectrum who asked questions frequently—their dialogue consisted almost exclusively of questions focusing on their special interests. But more recent accounts have indicated either that the frequency of question-asking in children on the spectrum does not differ significantly from their non-spectrum peers (Fleury & Ford, 2021; Jones and Schwartz, 2009) or that it is reduced (e.g., Murdock et al. 2007). A large body of intervention research has targeted question-asking in individuals on the autism

spectrum (e.g., Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Koegel, Koegel, Green-Hopkins, & Barnes, 2010; Raulston et al., 2013; Williams, Donley, & Keller, 2000; Doggett, Krasno, Koegel, & Koegel, 2013; Koegel, Vernon, Koegel, Koegel, & Paullin, 2012; Palmen, Didden, & Arts, 2008; Koegel, Bradshaw, Ashbaugh, & Koegel, 2014; Verschuur, Didden, Lang, Sigafos, & Huskens, 2014; Verschuur, Huskens, Verhoeven, & Didden, 2017). Studies have generally suggested that these interventions are efficacious and may even have collateral gains for broader communication and adaptive behaviors (Koegel, Bradshaw, Ashbaugh, & Koegel, 2014; Koegel, Koegel, Green-Hopkins & Barnes, 2010). More generally, question-asking has important implications for outcomes in autism spectrum disorder (ASD): the use of questions to elicit novel language structures from a social partner is associated with language growth on the part of the child (Koegel et al., 2010), and young children on the spectrum who use more frequent questions have better academic and social outcomes (Koegel et al., 1999) than those whose question asking is sparse.

However, despite the varied empirical findings in the literature about the frequency of question-asking in children on the spectrum and the long-term importance of this skill for development in ASD, there are relatively few studies that have simultaneously considered frequency, form *and* function of questions in ASD. With respect to form, Tager-Flusberg (1994), in her study of six children on the spectrum matched on chronological age and expressive language level to children with Down Syndrome, reported that children on the spectrum asked yes/no questions at a similar rate to children with Down Syndrome but asked fewer *wh*-questions; Sukenik and colleagues (2021) found that English-speaking children with ASD asked fewer grammatically correct *wh*-questions than a comparison sample of children with language impairment (although the same pattern was not found in a French-speaking sample). Goodwin, Fein, and Naigles (2012) found poorer *comprehension* of *wh*-questions in children on the spectrum. With respect to question function, Wetherby & Prutting (1984) observed that the questions of children on the spectrum may be most likely to serve directive (i.e., behavior regulation) functions; similarly, Tager-Flusberg (1994) noted that children on the autism spectrum asked fewer information-seeking and conversational (but not directive) questions than their non-spectrum peers.

Unfortunately, no further studies have simultaneously examined frequency, form, and function of spontaneous question-asking in children on the spectrum as compared to non-spectrum peers. Therefore, little is known about whether apparent deficits in question frequency in ASD disproportionately affect certain forms and/or functions. This is an important gap; a more comprehensive understanding of question-asking behavior in children on the spectrum will support the development of tailored interventions. Moreover, particularly with regards to observational data on question *function*, the empirical literature largely pre-dates 1995 (Wetherby & Prutting, 1984; Tager-Flusberg, 1994). Given important cohort effects over the past several decades in the field of ASD research (e.g., Keyes et al., 2012; Russell et al., 2021), such that those individuals diagnosed more recently tend to be more socially, linguistically and cognitively skillful, it is important to revisit these earlier findings to see if they are robust against important demographic changes in autism profiles. We undertake these goals in this study.

Finally, the research on early language in autism has emphasized the role of parental input (Bang et al., 2020). In general, parental language input is remarkably similar across autism and non-spectrum groups (e.g., Bang & Nadig, 2015; Fusaroli, Weed, Fein, & Naigles, 2019; Fleury & Ford, 2021; He, Luyster, & Arunachalam, 2022; see Bang, Adiao, Marchman, & Feldman, 2020 for a recent review). And although there is limited literature on the developmental correlates of parental questions for children on the autism spectrum *specifically*, studies suggest that (as with typically developing children) parental questions are supportive of language development for children with developmental and language delays more broadly (e.g., Dale et al., 1996; Hargrave & Senechal, 2000; Luo et al., 2022; but see Goodwin et al., 2015). Nevertheless, some studies suggest there are differences in question asking for parents of children on the autism spectrum, in two ways. The first is that parents of children on the spectrum may use relatively fewer questions (Bentenuto et al, 2021; Venuti et al., 2012; c.f. Fleury & Ford, 2021), pointing to important differences in question frequency. Second, parents of children on the autism spectrum may show differences in patterns of question function, relying more heavily than comparison groups on directive functions during interactions with their children (Venuti et al., 2012; but see Bentenuto et al., 2021). This is broadly similar to previous research suggesting a more directive style during parent-child interaction in parents of children with and at elevated genetic likelihood for autism, as compared to non-spectrum and low likelihood controls (Doussard-Roosevelt, Joe, Bazhenova, & Porges, 2003; El-Ghoroury & Romanczyk, 1999; Wan et al., 2012).

Therefore, in the present study, we focus on the spontaneous questions asked by children *and* parents during a dyadic, naturalistic parent-child interaction. The primary contributions of this work are threefold: (1) we simultaneously capture question frequency, form and function; (2) we follow up on important previous findings from more than 25 years ago, using a sample that is more representative of current trends in ASD demographics; and (3) we simultaneously capture both child and caregiver behavior. The data for the present study were obtained by coding existing transcripts from the *Nadig ASD English Corpus* in the Child Language Data Exchange System (CHILDES) database, comprised of children on the autism spectrum (n=12) and their parents as well as a comparison sample of children not on the autism spectrum with similar language (“non-spectrum”, n=20) and their parents. We aim to answer the following inquiries:

1. Do children on the spectrum differ from non-spectrum in (a) frequency of question asking; (b) form of questions asked; and/or (c) the predominant functions used?
2. Do parents of children in these two groups differ in (a) frequency of question asking; (b) form of questions asked; and/or (c) the predominant functions used?

Methods

Participants

We used the *Nadig ASD English Corpus* in the CHILDES database (MacWhinney, 2006), which consists of transcripts from English-acquiring children (ages 20-78 months, exposed

to English at least 75% of the time according to parent report) participating in ten minutes of unstructured play with their caregiver (Nadig & Bang, 2016; Bang & Nadig, 2015). From the 38 children included in the *Nadig ASD English Corpus*, we excluded one participant on the autism spectrum who had a very short play session duration and two non-spectrum participants who produced minimal utterances. Finally, in order to equate groups on overall language level (see below), we excluded three additional non-spectrum participants who were highly verbal. Therefore, 32 children (autism: $n = 12$; non-spectrum: $n = 20$) were analyzed for the current project. Participant MLU, tokens, and types were calculated using CLAN language software (MacWhinney, 2000); groups did not differ on mean length of utterance (MLU; autism spectrum mean MLU = 2.67; non-spectrum mean MLU = 2.79) or number of word tokens and types. The group of children on the spectrum was older (average age of 60.25 months) than the non-spectrum group (average age of 32.55 months). According to the *Nadig ASD English Corpus* documentation, all but three of the parents were female (2 parents in the autism sample were male, and 1 parent in the non-spectrum sample was male), and of the 17 parents for whom education information was known (10 in the autism spectrum sample, 7 in the non-spectrum sample), 10 had at least a university degree (5 in the autism spectrum sample, 5 in the non-spectrum sample) and 7 had less than a university degree (5 in the autism spectrum sample, 2 in the non-spectrum sample).

Procedure

Trained research assistants first examined each transcript and flagged all questions asked by the child and parent by using transcribed question marks as well as discourse context. They compared their lists, discussed whether each question was really a query based on the context of the surrounding dialogue, and finalized a list of questions for each participant in each dyad.

Questions were coded for form using the categories: yes/no (i.e., questions in which the subject and the auxiliary or copula verb are inverted, for example, *Is this water?*), *wh-* (i.e., questions that begin with *what*, *where*, *who*, *when*, *why*, *how*, *which*). For question function, a coding scheme was developed based on a literature review (e.g., Chouinard, 2007; Kurkul & Corriveau, 2017; James & Seebach, 1982; Tager-Flusberg et al., 1994) that included the following categories: requesting factual information (e.g., *What's that?* or *Are you happy?*), requesting explanatory information (e.g., *Why is the cereal hot?*), clarification (e.g., *What did you say?* or *Huh?*), requesting an action (e.g., *Can you fix this for me?*), requesting permission (e.g., *Can I go outside?*), recasting (e.g., *Is that a big green car?* following a child utterance of “green car”), choice (e.g., *Do you want chocolate or vanilla?*), filler (e.g., conversation-maintaining words or phrases in question form such as *Yeah?*, scripted phrases such as *You know? Right?* and *Okay?*), and modeling or prompting (e.g., *May I have one please?* after the child grabs a cookie out of mother's hand, or *More milk, what?* to prompt the child to say *please*). We also noted whether the questions were intelligible or not (the corpus contained the string “xxx” to indicate content the original transcribers deemed unintelligible).

Research assistants were trained on the coding scheme and independently coded every question across 12 of the transcripts (6 from each group); these 12 transcripts served as

the training set. Once coding was complete on the training set, inter-rater reliability was calculated at 95% agreement for form and 89% agreement for function. The coders then discussed every coding discrepancy and resolved it via consensus. This process was then repeated with the remaining 20 transcripts. Child diagnosis was masked from the coders.

Results

Child questions.

Of the 12 children on the spectrum, 6 produced no questions at all; of the 20 non-spectrum children, only 1 produced no question (see Table 1). Of those children who did produce questions, children on the spectrum produced fewer questions as a percentage of their total utterances (6.8%) than non-spectrum children (10%); a two-tailed Fisher's exact test showed that the group difference in the number of questions vs. non-questions was statistically significant ($p = 0.041$). This difference was not caused by differences in intelligibility; 92% of questions were intelligible in the children on the spectrum and 82% in the non-spectrum group (a two-tailed Fisher's exact test comparing the number of unintelligible to intelligible questions showed no group difference: $p = 0.29$). For children on the spectrum, but not non-spectrum children, question frequency increased as language level increased: children on the spectrum showed a significantly positive correlation between MLU and the proportion of their total utterances that were questions ($r(10) = 0.64$, $p = 0.025$; non-spectrum: $r(18) = -0.24$, $p = 0.30$).

For analyses of form and function, we excluded 12 questions from the spectrum group and 62 questions from the non-spectrum group that did not have canonical question syntax or that were otherwise impossible to code for form and/or function: questions that were incomplete (*what are...?*) or had unintelligible content, interjections like *hm?* or *huh?*, and questions lacking question syntax such as one-word questions like *ready?*, and phrases lacking a predicate like *chocolate or vanilla?*

With respect to question form, we found that children on the spectrum asked proportionally fewer *wh*-questions (and therefore proportionally more yes/no questions) than non-spectrum children. For children on the spectrum, 50% of questions were *wh*-questions, while for the non-spectrum group, 76% were. A two-tailed Fisher's exact test showed that this difference was statistically significant ($p = 0.031$).

With respect to question function, Table 2 shows the proportion of questions of each function type, split by group and by question form (yes/no vs. *wh*-). Given the small number of function types that were asked, we collapsed across form for analysis and computed the correlation between the number of questions of each function in the spectrum and non-spectrum groups; the correlation was high ($r(10) = 0.78$, $p = 0.002$). In both groups, "fact" questions composed approximately half of the questions asked. Thus, although children on the spectrum asked proportionally fewer questions, their questions served similar functions as for non-spectrum children.

Parent questions.

Parents of children on the spectrum asked significantly fewer questions as a percentage of their total utterances (30%) than parents of non-spectrum children (44%); a two-tailed Fisher's exact test showed that the group difference in the number of questions vs. non-questions was significant ($p < 0.0001$); see Table 1. Parental question frequency (the proportion of utterances that were questions) was significantly positively correlated with the child's MLU for children on the spectrum ($r(10) = 0.61, p = 0.035$) but not non-spectrum children ($r(18) = 0.012, p = 0.96$).

Once again, for analyses of form and function, we excluded questions that did not have canonical question syntax or that were otherwise impossible to code for form and/or function: 120 in the spectrum group and 274 in the non-spectrum group.

With respect to form, as compared to children, parents show a much smaller group difference in the percentage of *wh*- vs. yes/no questions, but the pattern is in the opposite direction than in the children's data: in the group of parents with children on the spectrum, 39% of parent questions were *wh*- questions, and in the non-spectrum group, 32% were. This difference was statistically significant (Fisher's exact test $p = 0.0088$).

With regards to question function, the number of questions of each type was very highly correlated across groups. Because there were many more questions for parents than children, we did not collapse across yes/no and *wh*- questions but instead computed correlations between groups for each type: for yes/no questions: $r(6) = 0.99, p < 0.0001$; for *wh*- questions, $r(5) = 0.98, p < .0001$. Thus, like children, parents ask questions with similar functions despite differences in frequency and form.

Discussion

This study offers three important areas of advancement to the study of question asking in autism. First, we explore the important intersection of question frequency, form (yes/no and *wh*-) and function (e.g., asking permission, asking for an explanation). Second, we do so using a contemporaneous, existing corpus (Nadig & Bang, 2016; Bang & Nadig, 2015), which better captures the current demographics of the autism spectrum than samples studied more than 25 years ago (Wetherby & Prutting, 1984; Tager-Flusberg, 1994). Finally, we simultaneously capture both child and parent questions. Our results showed both similarities and differences between spectrum and non-spectrum children that parallel similarities and differences in their parents. There are three key findings.

First, we found that children on the spectrum asked significantly fewer questions, when accounting for the overall number of utterances. Moreover, the difference that we observed in our sample was driven by a reduced usage of *wh*-questions specifically. This finding is consistent with previous studies suggesting difficulties for children on the spectrum with *wh*-questions in both production (Tager-Flusberg, 1994) and comprehension (Goodwin, Fein, & Naigles, 2012; Jyotishi et al., 2017). However, our result is counter to early accounts of excessive question asking in autism (Prizant & Rydell, 1993; Hurtig, Ensrud, & Tomblin, 1982; Kanner, 1943), as well as more recent accounts finding no differences in frequency

of spontaneous questions between children on the spectrum and non-spectrum peers (Fleury & Ford, 2021; Jones and Schwartz, 2009). This discrepancy may be partly driven by child language level; for instance, although the average *chronological* age of the autism sample (5.7 years) reported by Jones and Schwartz (2009) was similar to our own (5 years), they reported that the average expressive language age equivalence was in advance of that (6.6 years). In contrast, in our autism spectrum sample, the MLU (roughly 2.7) falls at a developmental age of roughly 2.5 years (e.g., Brown, 1973), far below the developmental level reported by Jones and Schwartz (2009). Our finding of a positive association between child question-asking frequency and child MLU for children on the spectrum (but not our non-spectrum group) underlines the importance of considering the role of larger language ability in question asking for children with autism and is in alignment with previous findings: Tek and colleagues (2014) reported that for their autism spectrum “high verbal” group, whose MLUs approximate those reported in the present study, *wh*-question mastery increased with higher MLUs. In sum, then, our results suggest that question frequency is reduced in individuals on the spectrum, but more research is needed to better understand the relationship between question asking and grammatical mastery, and whether this relationship looks different in children with and without language impairments/delays.

A second key finding was that the functions served by children’s questions are broadly comparable in children on the spectrum and non-spectrum children. In both groups, children primarily asked information seeking questions requesting factual information (e.g., *What’s that?*). This is in contrast to previous reports (Tager-Flusberg, 1994; Wetherby & Prutting, 1984) revealing deficits in information seeking questions. One possible interpretation of this discrepancy is that it is an artifact of important cohort effects. It is clear that individuals who receive ASD diagnosis in recent years are more socially, linguistically and cognitively skillful than those diagnosed in previous decades (e.g., Keyes et al., 2012; Russell et al., 2021). In this case, although individuals enrolled in studies in the 1980s and 1990s may have exhibited specific functional deficits in question-asking, that may no longer be the case for individuals who are diagnosed today. Indeed, although the average MLU between our sample and Tager-Flusberg (1994) and Wetherby & Prutting (1984) are similar, the previous samples were chronologically older, suggesting a greater degree of global impairment in these historical samples than in our more recent one. It is also worth noting that all of these autism study samples (ours included) are small, with ours (n=12) being larger than Tager-Flusberg (1994) and Wetherby & Prutting (1984) combined (n=6 and n=4, respectively); all told, there is a clear need for more representative and current samples.

Finally, our results show that children’s question-asking behavior resembles that of their parents in frequency and function but not in form. Parents of children on the spectrum, like their children, ask significantly fewer questions as a proportion of their total utterances than parents of non-spectrum children. This is consistent with former accounts (Bentenuto et al., 2021; Venuti et al., 2012). Similarly, the positive association between child MLU and parental questions that we found in our autism spectrum (but not our non-spectrum sample) is reminiscent of previous findings in non-spectrum children that parents increase their use of yes/no and *wh*-questions as their child advances from lower (i.e., around 1) to higher MLU (2 to 3) (Pan et al., 1996). Also like their children, parents of children on the spectrum and parents of non-spectrum children ask questions with similar functions—for

parents, these were primarily questions requesting factual information (e.g., *What's that?*) and questions requesting an action (e.g., *Can you close the door?*). With respect to form, we found that parents of children on the spectrum asked proportionally *more* open-ended *wh*-questions (e.g., *What animal's on there?*, *What's her name?*) and fewer closed-ended yes/no questions (e.g., *Is there something in there?*) relative to parents of non-spectrum children. Thus, the reduced frequency of *wh*-questions in children on the spectrum, as well as the poorer *wh*-question comprehension abilities reported in Goodwin et al. (2012), are unlikely to be caused by insufficient *wh*-questions in the input.

There are important limitations to consider in interpreting these findings. First, there are known cultural differences in question-asking (Gauvain et al., 2013; Kuchirko et al., 2015). Due to the limited availability of family information in CHILDES, we are unable to provide a rich cultural characterization of these participants, and it is important to note that our findings may not generalize across other samples. Second, our reliance on MLU to match groups fails to capture the complex heterogeneity of language and communication ability in individuals on the autism spectrum. There are likely to be many other abilities that contribute to question-asking frequency, form, and function that should be considered in future research. Finally, we are not able to make inferences about directionality in parent and child question-asking behavior. Do parents of children on the spectrum ask fewer questions because their children do, or is it the reverse—or both? We also do not have available data about children's later language or cognitive outcomes to determine the effects of different types of early input. Parental language that is related to the child's focus of attention is broadly facilitative of child language development for children on the spectrum as well as other children with developmental and language impairments (e.g., Bottema-Beutel & Kim, 2021; Mehl et al., 2021; Yoder, 1989; Yoder et al., 1994). However, the particular role of parent question-asking for children on the spectrum is unclear. Goodwin, Fein, and Naigles (2015) addressed this question most directly and reported that mothers' use of certain types of *wh*-questions (specifically, those with *be* as the main verb) was *negatively* associated with later child question comprehension for children on the spectrum (but not for non-spectrum children), while the opposite pattern held for other types of *wh*-questions (those with lexical verbs as the main verb). Thus, the relations between parent language input and child language outcomes are complex and likely related to the child's abilities to take in and learn from the language input they hear (e.g., Arunachalam & Luyster, 2016, 2018). Longitudinal work with large sample sizes that looks at frequency, form, and function of questions will be required to fully understand relations between parent and child language in question-asking behavior.

In sum, we used a comprehensive approach and a contemporaneous sample to explore question asking in dyads of parents and children with and without autism, wherein we simultaneously captured question frequency, form and function. Our findings suggest that, relative to non-spectrum dyads (1) the interactions of parents and children on the spectrum may be characterized by a reduced frequency of questions on the part of *both* participants; (2) children on the autism rely *less* on *wh*-questions and parents of children on the spectrum rely *more* on *wh*-questions; and (3) the functions of questions asked by children on the spectrum and their parents serve similarly diverse functions. We hope that this information can support evidence-based interventions by emphasizing the potential value of increasing

question *frequency* for both children and their caregivers, with a particular focus on scaffolding child use of open-ended *wh*-questions. At the same time, however, it is important to consider that – unlike the results reported in previous studies – our results suggest that for many of today’s children on the autism spectrum and their parents, using diverse functions is an existing strength that could be harnessed in family and clinical settings. By capitalizing on these areas of skill, providers and caregivers can scaffold children in building a range of question-asking proficiencies that will serve them at home, at school and beyond.

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Table 1.

Participant information

Diagnosis	Age in Months	MLU	# of utterances child produced	# which were questions (child)	# of utterances parent produced	# of which were questions (parent)
TD	42.05	2.651	43	7	200	87
TD	31.21	2.756	45	1	147	37
TD	37	4.12	57	6	153	63
TD	52.21	3.69	55	6	101	53
TD	37.11	3.38	102	3	206	103
TD	32.16	2.763	97	1	198	107
TD	34.6	3.565	85	10	211	89
TD	23.19	1.08	52	11	236	76
TD	37.5	3.483	60	3	101	38
TD	23.05	1	2	0	176	117
TD	31.2	4.259	81	17	141	67
TD	32.8	2.532	47	6	154	68
TD	31.27	3.138	87	4	165	88
TD	26.05	1.763	38	5	111	43
TD	27.12	1.533	60	7	230	115
TD	26.29	2.049	102	8	160	49
TD	26.03	2.364	44	15	86	41
TD	20.29	1.514	35	8	133	59
TD	43.16	4.747	75	1	90	45
TD	42.29	3.458	48	2	182	65
ASD	50.04	1	2	0	287	45
ASD	43.02	2.3	26	2	163	40
ASD	78.27	4.22	68	3	82	39
ASD	72	4.11	34	10	167	63
ASD	38.25	1.8	36	0	128	54
ASD	58.17	4.33	72	10	128	52
ASD	61.21	2.64	47	0	190	68
ASD	64.25	1.14	56	0	199	82
ASD	52.13	1.71	38	1	246	41
ASD	75.1	4.061	82	8	153	58
ASD	63.07	1.375	24	0	252	45
ASD	65.15	3.412	17	0	159	51

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Table 2.

Number of children's questions serving each question function, with each function further subdivided by question form.

Question Type	ASD	TD	ASD	TD	Total
Fact	10	32			42
Yes/no			4	6	
<i>Wh-</i>			6	26	
Explanatory	4	15			19
Yes/no			0	0	
<i>Wh-</i>			4	15	
Clarification	1	1			2
Yes/no			0	0	
<i>Wh-</i>			1	1	
Action	2	8			10
Yes/no			2	7	
<i>Wh-</i>			0	1	
Permission	5	1			6
Yes/no			5	1	
<i>Wh-</i>			0	0	
Recast	0	2			2
Yes/no			0	0	
<i>Wh-</i>			0	2	
Choice	0	0			0
Yes/no			0	0	
<i>Wh-</i>			0	0	
Filler	0	0			0
Yes/no			0	0	
<i>Wh-</i>			0	0	
Model/prompt	0	0			0
Yes/no			0	0	
<i>Wh-</i>			0	0	
Excluded (e.g., unintelligible)	12	62			74
Total	34	121			155

Table 3.

Number of parents' questions serving each question function, with each function further subdivided by question form.

Question Type	ASD	TD	ASD	TD	Total
Fact	236	541			777
	Yes/no		91	274	
	Wh-		145	267	
Explanatory	21	17			38
	Yes/no		0	0	
	Wh-		21	17	
Clarification	9	10			19
	Yes/no		0	0	
	Wh-		9	10	
Action	193	421			614
	Yes/no		172	356	
	Wh-		21	65	
Permission	23	43			66
	Yes/no		23	43	
	Wh-		0	0	
Recast	31	81			112
	Yes/no		27	77	
	Wh-		4	4	
Choice	2	17			19
	Yes/no		2	16	
	Wh-		0	1	
Filler/Empty	1	2			3
	Yes/no		1	1	
	Wh-		0	1	
Model/Prompt	2	4			6
	Yes/no		0	3	
	Wh-		2	1	
Excluded from analysis (e.g., unintelligible, directed to someone other than the child)	120	274			394
Total	638	1410			2048